DOCUMENT RESUME

ED 028 043 24 RE 001 635

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Selected Factors in Spoken Language Related to First-Grade Reading Achievement.
Chicago Univ., Ill.
Spons Agency-Office of Education (DHEW), Washington, D.C. Bureau of Research.
Bureau No-BR-7-E-125
Pub Date Jun 68
Contract-OEC-0-8-080125-0219
Note-29p.
EDRS Price MF-$0.25 HC-$1.55
Descriptors-Beginning Reading, *Grade 1, Kernel Sentences, *Language Patterns, Language Research, Oral Communication, Predictive Ability (Testing), *Reading Achievement, Reading Readiness Tests, *Sentence Structure, Socioeconomic Status, Transformations (Language), *Vocabulary

The relationship between first-grade reading achievement and selected experimental language measures was investigated. The measures selected for study were (1) number of T-units (communication units) spoken in an experimental situation, (2) mean length of T-unit, (3) ratio of subordinate clause length to T-unit length, (4) ratio of sentence-combining transformations to T-units, (5) percent of words at Thorndike-Lorge frequency levels 1 and 2, (6) percent of words at Thorndike-Lorge frequency levels 3-5, and (7) the type-token ratio. Subjects were 60 first-grade pupils from six suburban schools representing three socioeconomic levels. No single language measure nor any combination of these measures was found to have as much value in predicting reading achievement as did the Metropolitan Readiness Test (MRT). Certain combinations of the experimental language measures added significantly to the value of the MRT in predicting first-grade achievement in both word recognition and comprehension. Mean T-unit length added significantly to the value of the readiness test in predicting comprehension. Other findings and conclusions are offered. Tables and references are included. (Author/CM)

BR 7-E-125
PA-24
OE-BR

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JUNE 1968

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education

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RE 001 635

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SELECTED FACTORS IN SPOKEN LANGUAGE RELATED TO FIRST-GRADE READING ACHIEVEMENT

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Chicago, Illinois

June 30, 1968

The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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I. SUMMARY:

The purpose of this investigation was to determine the relationship between first-grade reading achievement and selected indices of volubility, of syntactic control and flexibility, and of extent and diversity of vocabulary in spoken language. The experimental language measures selected for study were: (1) number of T-units (communication units) spoken in an experimental situation; (2) mean length of T-unit; (3) ratio of subordinate clause length to T-unit length; (4) ratio of sentence-combining transformations to T-units; (5) per cent of words at Thorndike-Lorge frequency levels 1 and 2 (the "commonest" English words); (6) per cent of words at Thorndike-Lorge frequency levels 3-5; (7) the type-token ratio.

Answers to the following questions were sought: (1) Do the experimental language measures show a significant relationship to first-grade reading achievement? (2) Do any of the experimental language measures predict level of reading achievement as accurately as does a standardized reading readiness test? (3) How much do the experimental language measures and combinations of these measures add to the predictive value of a standardized reading readiness test?

Predictive and criterion scores were obtained from a stratified random sample of sixty suburban pupils. Predictive data consisted of (1) scores on the Metropolitan Readiness Test, administered near the beginning of grade one; and (2) scores on the experimental language measures, (derived from linguistic analysis of three separate samples of subjects' spoken language produced in experimental situations), near the beginning of grade one. The criterion data were scores on the Gray Oral Reading Test and on the reading sub-tests of the Stanford Achievement Test, Primary I Battery, administered near the end of grade one.

Correlational and regression techniques were used to determine magnitude of relationships among variables, to compare the predictive values of the readiness test and the experimental language measures, and to determine whether the language measures significantly increased the predictive value of the readiness test. A coefficient of reliability for each experimental language measure was obtained by a two-way analysis of variance technique.

Major findings included the following: (1) Coefficients of reliability for language measures across three interview situations were in the low to moderate range. (2) Certain combinations of the experimental language measures added significantly to the value of the Metropolitan Readiness Test in predicting first-grade achievement in both word recognition and comprehension. Furthermore, a single language measure (mean T-unit length), added significantly to the value of the readiness test in predicting comprehension. (3) No single language measure nor any combination of these measures was found to have as much value in predicting reading achievement as did the MRT. (4) Neither sex nor socio-economic status was found an important factor in either reading achievement or language competency as measured in this investigation.

Major conclusions were: (1) The value of the Metropolitan Readiness Test as a predictor of first-grade word-recognition achievement can be significantly increased by the addition of measures of oral vocabulary range and diversity, and by the addition of all experimental language measures selected for study. (2) The value of MRT as a predictor of comprehension can be significantly increased by the addition of a measure of mean T-unit length. (3) The value of MRT as a predictor of vocabulary or of oral reading cannot be increased by the addition of the experimental language measures. (4) MRT, when used alone, is a higher predictor of first-grade reading achievement than are any of the experimental language measures. (5) Reliability findings indicate that it cannot safely be assumed that a single interview provides a reliable language sample.

Findings indicate that the Metropolitan Readiness Test, though it presently comprises certain measures of language competency, could be made a better predictor of reading achievement by the incorporation of selected linguistic predictors. Further research is needed: (1) To determine how much language, and what types of experimental situations, will produce optimally reliable linguistic measures. (2) To compare the predictive value of mean T-unit length and other promising indices from the present study with other linguistic measures such as Yngve's "mean word depth measure", and with scores on paper-and-pencil type tests of syntactic control. (3) To follow up the reading achievement of this study's subjects in grades 2 and 3. (4) To explore qualitative as well quantitative aspects of spoken language in relation to early reading achievement.

II. INTRODUCTION:

Linguists and specialists in the field of reading concur in the assumption that ability to learn to read rests upon a foundation of skill in comprehending and producing the spoken language. It was the purpose of this investigation to examine this assumption in some detail--to determine the relationship between first-grade reading achievement and certain specific measures of volubility, of syntactic control and flexibility, and of extent and diversity of vocabulary.

Answers to these questions were sought: (1) Do selected factors identified in previous research as indices of maturity in children's use of language show a significant relationship to first-grade reading achievement? (2) Do any specific oral language factors predict level of reading achievement as accurately as does a standardized reading readiness test? (3) How much do specific oral language factors and combinations of these factors add to the predictive value of a standardized reading readiness test?

The following hypotheses were tested:

Hypothesis 1. A significant relationship will be found between four syntactic factors in oral language protocols, (a) number of T-units; (b) mean length of T-unit; (c) ratio of subordinate clause length to T-unit length; (d) ratio of sentence-combining transformations to T-units, and scores on subsequently administered standardized measures of oral and silent reading achievement in first grade.

Hypothesis 2. A significant relationship will be found between two vocabulary factors in oral language protocols, (a) per cent of words at selected Thorndike-Lorge frequency levels; and (b) type-token ratio, and scores on subsequently administered standardized measures of oral and silent reading achievement.

Hypothesis 3. Each of the indices of oral language competency selected for study will have a consistently higher relationship with scores on standardized measures of oral and silent reading achievement than will scores on a standardized measure of reading readiness.

Hypothesis 4. Combinations of syntactic and/or vocabulary factors will have a consistently higher relationship with scores on standardized measures of oral and silent reading achievement than will scores on a standardized measure of reading readiness.

Hypothesis 5. Each of the syntactic and vocabulary factors will add significantly to the predictive value of a standardized reading readiness test in predicting scores on a standardized measure of reading achievement.

Hypothesis 6. Combinations of the syntactic and/or vocabulary factors will add significantly to the predictive value of a standardized reading readiness test in predicting scores on a standardized measure of reading achievement.

For purposes of statistical analysis, the hypotheses were tested in null form.

The terms pertinent to the analysis of oral language samples elicited from subjects in this investigation are defined below.

Protocol. This term is used to designate the verbatim record of a subject's oral language output in the experimental situation. All language produced was tape-recorded and transcribed exactly as spoken by each subject.

T-unit. The T-unit is a grammatically discrete unit consisting of one main clause plus the subordinate clausal and subclausal structures attached to or embedded within it. It can be identified by segmenting connected discourse into independent predications which it would be grammatically permissible to write, beginning with a capital letter and concluding with a period or question mark.

Language garbles. Four types of oral phenomena which are not pertinent to the syntactic structure of what is being said were excluded from syntactic analysis, although the "holders," "repeats" and "edits" were included in the vocabulary analysis. These oral phenomena are the following: a) Holders--e.g., "well," "you see"; b) Edits--words used by the speaker to correct or change direction of what is being said, such as "So then (he, I mean to say) the hunter was going to shoot the dove"; c) Repeats--repetitions of words or phrases such as "you-you."

Word frequency. This is a measure for estimating the extent or range of vocabulary. The Thorndike-Lorge list of 30,000 English words, divided into five levels of frequency, was the criterion for estimating the relative frequency of use of words produced by the subjects.

Type-token ratio. This is a measure of the diversity of vocabulary used by the subjects. Ratio of the number of different words (types) to the total number of words (tokens) was computed.

Sentence-combining transformations. Among the rules of the grammar presently being formulated by generative transformational linguists, there is a set of rules which designate grammatical operations capable of effecting one "combined" sentence where otherwise there would have been two or more "kernel" sentences. For example, a speaker might produce these three kernel sentences: "The bird is in the tree. The bird is singing a song. The song is pretty." These kernel sentences could be transformed under the rules of the grammar to produce a sentence containing two sentence-combining transformations. An example of such a sentence would be: "The bird in the tree is singing a pretty song."

Language competency. For purposes of this research, language competency is defined as the level of production of the syntactic and vocabulary factors included for study in this investigation.

III. THE SIGNIFICANCE OF THE STUDY:

There appears to be unanimous agreement among reading specialists and specialists in allied fields that beginning reading achievement is closely related to oral language development. However, the amount, quality or measures of language have never been adequately specified. Essentially, a search for means of specifying factors in oral language which are meaningfully related to beginning reading was the basic problem with which this study was concerned.

The significance of the present study lies in its effort to identify and measure certain carefully selected and highly specific language factors which may facilitate or inhibit success in beginning reading. In spite of current concern about the presumed language deficiencies of culturally disadvantaged children, and in spite of the current interest in "linguistic"

and "language-experience" approaches to reading instruction, little research has been done to determine relationships between specific factors in school beginners' spoken language and later reading achievement.

Although it is apparent that some measurement of language competency is a component of reading readiness tests, scores on such tests provide only very gross indications of oral language competency, and are of little value in the diagnosis of specific language deficiencies or in the prediction of individual achievement in reading. So long as there is uncertainty as to which factors in oral language are measurably related to early reading achievement, the schools will be hampered in their efforts to predict reading achievement, to plan programs of reading instruction consonant with children's language abilities, and to provide remedial programs to meet the needs of pupils found deficient in language development.

It is a part of the "conventional wisdom" of reading instruction that an unspecified degree of oral language competency is basic to learning to read, and there is a limited body of empirical evidence which generally supports this view. However, there is need for a continuing search for more specific knowledge of oral language-reading relationships, so that the components of language competency prerequisite to success in beginning reading may be more clearly identified.

IV. BACKGROUND OF THE STUDY:

An examination of the related literature identified three main sources of information which provided both a conceptual framework for the investigation and guidelines for methods and procedures used in testing the hypotheses formulated.

First, it was found that reading specialists, linguists and psycho-linguists who have concerned themselves with oral language-reading relationships have failed to specify the aspects of language development which are most important to reading achievement.

The second source of information, investigations of children's language development, revealed that during the

period from the mid-1920's to about 1960, a number of investigators, notably McCarthy and Templin, derived their methods of syntactic and vocabulary analysis from traditional school grammar. They focused attention upon such language factors as the number, length and traditional grammatical classification of "sentences"; upon the proportional incidence of "parts of speech," and upon what were conceived to be "errors" in morphology and syntax.

During the past decade, two schools of linguistic science, with differing approaches to the study of language, have been particularly influential in directing the course of research into children's language development. The main thrust of one school (the structuralists), has been toward a detailed description of the overt structure of language--the ways in which phonological, morphological and syntactic units are patterned in utterances of native speakers. The thrust of the transformationalists has been toward an explanation of the ways in which native speakers generate sentences.

Recent investigators who have been markedly influenced by the structural approach include Strickland and Loban. Investigators who have been strongly influenced by the generative transformational approach include Menyuk, Hunt, and O'Donnell, Griffin, and Norris.

The structuralist approach to the study of children's language has so far produced little useful information concerning indices of "linguistic maturity." On the other hand, recent investigations of the syntax of pre-school and school age children, using the techniques of transformational analysis, have clearly differentiated stages of linguistic development.

Third, a review of prior investigations of oral language-reading relationships showed that their findings are neither specific nor cumulative. There is, however, sufficient evidence from such investigations to indicate that certain syntactic and vocabulary factors in oral language tend to be related to beginning reading achievement, and to point up the need for fresh attacks upon the problem.

Synthesis of findings from investigations of children's language development led to the conclusion that mean length of communication unit, ratio of sentence-combining transformation to communication units, ratio of subordinate clause length to length of communication unit, and measures of extent and diversity of vocabulary are promising indices of children's maturity in the use of language. No previous investigation was found which used a combination of the foregoing linguistic measures as predictors of first-grade reading achievement, nor has any previous investigation compared the predictive value of specific linguistic factors with the predictive value of a standardized reading readiness test.

V. PROCEDURES OF THE INVESTIGATION:

The following steps were taken to test the hypotheses.

Selection of Subjects.--The subjects in this study were sixty first-grade pupils selected by stratified random sampling from public schools in a south Chicago suburb having a population representing a fairly wide socio-economic range. Five boys and five girls were randomly selected from each of six schools representing three predominant socio-economic levels.

Predictive and Criterion Measures of Reading Achievement.--Two types of predictors of reading achievement were examined and compared in this study: (1) a standardized measure of reading readiness, and (2) experimental measures of syntactic and vocabulary factors in oral language.

The standardized readiness test selected, on the basis of its comparatively well-substantiated predictive validity, was the Metropolitan Readiness Test.

The experimental linguistic predictors of reading achievement were selected on the basis of an extensive review of the previous research literature, which showed that certain measurable factors in the oral language of pre-school and school-age children have been found positively related to increasing chronological age ("maturity"). These factors are listed in the succeeding section on "Analysis of Language Samples."

For the purpose of securing data concerning the intelligence of subjects, the Kuhlman-Anderson Test was given.

Criterion tests included both oral and silent reading measures: the Gray Oral Reading Test and the Reading Test of the Stanford Achievement Test, Primary I Battery. The latter test gives separate grade-equivalent scores for Word Recognition, Paragraph Comprehension, and Vocabulary. It should be noted that the Stanford Vocabulary sub-test is essentially a test of listening vocabulary, rather than of independent reading vocabulary.

Administration of Tests.--During the first two school months the intelligence, readiness and language measures were administered to all subjects.

Individual interviews were conducted by the investigator to obtain language measures. Three stimuli to elicit separate language protocols were shown to each subject: two silent cartoon films with culturally non-biased content, and one series of illustrations from a widely-used multi-ethnic basal primer. Following presentation of each separate stimulus, the subject was asked to tell in his own words the "story" represented in the stimulus, and to give his individual response to a "thought question" related to the stimulus. A uniform schedule of questions (developed in a pilot study which preceded the main investigation) was used to elicit three separate protocols from each subject. Interviews were conducted in a private setting in the respective schools. No time limit was set on the interviews, but the average time required to secure three protocols from each subject was about fifty minutes.

Syntactic and vocabulary analysis of language samples

After the taped interviews had been transcribed, the investigator carried out a linguistic analysis of each protocol. By the use of both double-checked hand-scoring and computer-assisted procedures, the following linguistic measures were obtained:

1. Extent of vocabulary as measured by per cent of words found at selected frequency levels on the Thorndike-Lorge list.

2. Diversity of vocabulary as measured by the type-token ratio, computed by Carroll's formula so as to be relatively independent of length of language sample.

3. Number of T-units produced in the experimental situation.

4. Mean length of T-units.

5. Ratio of number of sentence-combining transformations to number of T-units.

6. Ratio of subordinate clause length to T-unit length.

Statistical Treatment.--Correlation and regression techniques were used to determine magnitude of relationships among variables, to compare the predictive values of the readiness test and the linguistic measures, and to determine whether the linguistic predictors significantly increased the predictive value of the readiness test. More specific information concerning statistical treatment will be given where appropriate in the following section.

VI. FINDINGS AND DISCUSSION:

This section reports the major findings related to the reliability of language measures, to the hypotheses, and to the ancillary information accrued in the process of testing the hypotheses.

Reliability of Linguistic Measures.--Before the hypotheses were tested, it was essential to secure an estimate of the reliability of the language measures used. Since three separate stimulus situations had been used to elicit language samples, it was possible to use Hoyt's technique for estimating test reliability by two-way analysis of variance. It was found that the coefficients of reliability for language measures across three sampling situations were in the low to moderate range. The moderate coefficients found were for the measures involving a raw word-count, such as number of T-units produced ($r = .63$), number of words in T-units ($r = .63$), number of different words ($r = .65$), and the total number of words produced ($r = .65$). Lower

reliabilities, ranging from .26 to .49, were found for the ratio measures of syntactic complexity and the type-token ratio. It is possible that the reduced magnitude of these coefficients was at least partly caused by an increase in error variance which occurred when two measures were used jointly in deriving a ratio measure. The lowest coefficients of reliability, ranging from .00 to .19, were found for the per cent of words at each of five individual Thorndike-Lorge frequency levels. Consequently, combined frequency levels (levels 1-2 and 3-5), having reliabilities of .26 and .21 respectively, were used as measures of vocabulary range, and the per cents of words at each individual level were eliminated from the data used in testing the hypotheses.

The foregoing findings were totally unanticipated, in the light of the casual treatment of the problem of reliability in previous research reports. For example, Loban (the only investigator found who described any type of test-retest reliability data) reported using simple correlational techniques to test the reliability of the "number of communication units" produced by individual subjects from one year to the next in his longitudinal study. Loban's "communication units" are essentially the same as "T-units" used in this study. Findings in the present investigation supported Loban's conclusion that subjects, over time and in separate stimulus situations, tended to "maintain consistency of performance in the number of communication units they use.

However, it is important to note that in the present study, a more extensive and rigorous procedure for testing reliability was used than that reported by Loban. The present procedure was more extensive in that not one but all of the selected linguistic measures were tested for reliability. The greater rigor of the present technique is attested to by authorities in the field who judge that the two-way analysis of variance technique sets the lower limits of reliability of a test.

The generally low coefficients of reliability found for syntactic and vocabulary items in the present study made it desirable to combine data from all three sampling situations, in order to secure the most dependable measures available under the conditions of this investigation. Present reliability findings have raised serious questions about

methods of language sampling previously used, and point to the need for continued research aimed specifically at determining how much language, and what types of experimental situations, will produce dependable measures of oral language.

The Hypotheses.--The findings and interpretations for six hypotheses previously set forth in this abstract will be reported below for three pairs of hypotheses. Hypotheses 1 and 2 were related in that Hypothesis 1 dealt with the possible role of syntactic factors in reading, while Hypothesis 2 dealt with vocabulary factors. Hypotheses 3 and 4 can be presented as a pair because the former dealt with individual indices of linguistic competency, while the latter dealt with combinations of these indices. Hypotheses 5 and 6 were paired because Hypothesis 5 was concerned with each of the syntactic and vocabulary factors, while Hypothesis 6 dealt with combinations of these factors.

Hypotheses 1 and 2

The coefficients of correlation found between the syntactic and vocabulary measures and the criterion measures were not of sufficient magnitude to be of any value in predicting reading achievement from these linguistic measures, as can be seen in Table I. Therefore Hypotheses 1 and 2 were rejected.

These findings need not be interpreted to mean that there is no relationship between oral language competency and early reading achievement. However, it is apparent that the selected measures (out of the great variety of linguistic measures potentially available for investigation) did not prove to be closely related to first-grade reading achievement. Of course it is possible that the measures used might be found more closely related to reading achievement at later grade levels, and this possibility should be investigated. Furthermore, as more adequate and reliable measures of linguistic competency are developed in future investigations, it may become possible to predict a significant per cent of the variance in beginning reading by oral language measures.

Hypotheses 3 and 4

Results of correlational procedures, reported in Table I, and of regression analyses, reported in Table II, showed that

TABLE 1

Intercorrelations Among Predictive and Criterion Measures

VARIABLE	MRT 1	IQ 2	SYNTACTIC MEASURES 3	4	5	6	VOCABULARY MEASURES 7	8	9	ACHIEVEMENT MEASURES 10	11	12
1 MRT												
2 IQ	.55											
3 NUM T-UNITS	-.07	-.21										
4 MEAN T-U	.20	.08	.11									
5 RAT S-C/T-U	.18	-.01	.07	.89								
6 RAT SUB/T-U	.25	.20	.13	.79	.68							
7 F L 1-2	-.04	.09	.00	.14	.13	.04						
8 F L 3-5	.18	.14	-.41	-.13	-.15	-.11	-.51					
9 TTR	.17	.07	-.36	.41	.35	.55	.01	-.10				
10 SAT WD	.59*	.55	-.02	-.01	.05	.11	-.06	-.14	-.03			
11 SAT PARA	.45*	.49	-.04	-.18	-.12	-.02	-.19	.04	-.09	.79		
12 SAT VOC	.62*	.55	.04	.23	.18	.33**	-.21	.10	.29***	.45	.45	
13 GRAY ORAL	.49*	.51	-.15	.00	.02	.10	.11	-.04	.01	.74	.66	.38

* p is .001 ** p is .01 *** p is .05

TABLE II

Contributions to the Variance in Reading Achievement Made by MRT, by Seven Language Variables Combined, and by Four Language Variables Combined

ACHIEVEMENT MEASURES	Per Cent Contributed by MRT	Per Cent Contributed by Seven Language Variables	Per Cent Contributed by Four Language Variables
1 SAT WD	35.0% $p < .0001$	9.8% $p < .5822$	6.1% $p < .4722$
2 SAT PARA	20.4% $p < .0003$	10.0% $p < .5723$	6.3% $p < .4565$
3 SAT VOC	38.7% $p < .0001$	19.0% $p < .1256$	15.0% $p < .0589$
4 GRAY ORAL	24.4% $p < .0001$	6.6% $p < .8088$	2.5% $p < .8373$

the Metropolitan Readiness Test accounted for a greater per cent of the variance in first-grade reading achievement than did the experimental linguistic measures. Accordingly, Hypotheses 3 and 4 were rejected.

It is possible that in later grades, as the syntactic complexity of criterion test items becomes a more crucial factor in achievement than it is at first-grade level, oral language measures may have greater value as predictors of criterion scores. However, it is apparent that the Metropolitan Readiness Test, which incorporates measures of visual perceptual abilities as well as measures of listening comprehension and vocabulary, is a far better predictor of group performance on first-grade achievement measures than are the experimental linguistic predictors.

Hypotheses 5 and 6

Results of step-wise regression analyses to determine the increase in predictive value of the Metropolitan Readiness Test produced by addition of each linguistic predictor and of combinations of these predictors showed that Hypotheses 5 and 6 were supported only in part. They were accepted, with qualifications, insofar as they related to criterion measures of paragraph comprehension and word recognition, but they were rejected for the criterion tests of oral reading and listening vocabulary. Tables III and IV present the findings from the step-wise regression analyses.

The qualifications concerning Hypotheses 5 and 6 must be made since not all linguistic predictors or combinations of these predictors added significantly to the predictive value of the standardized readiness test. However, the addition of linguistic predictors to the Metropolitan Readiness Test improved prediction in the following areas:

1. A measure of oral vocabulary range plus a measure of oral vocabulary diversity added significantly to the value of the readiness test in predicting word recognition achievement.

2. A combination of all seven experimental predictors added significantly to the value of the readiness test in predicting word recognition achievement.

TABLE III

Additional Per Cent of Variance Accounted for by Each Individual Language Factor When Added Separately to a Regression Equation with MRT

		INDEPENDENT VARIABLES ADDED						
		1	2	3	4	5	6	7
DEPENDENT VARIABLES	MRT	NUM T-U	F L 1-2	F L 3-5	MEAN T-U	RAT S-C/T-U	RAT SUB/T-U	TTR
1 SAT WD	34.96	.05	.11	6.83*	1.90	.46	.14	1.60
2 SAT PARA	20.42	.02	3.16	.18	7.80*	4.34	1.84	2.83
3 SAT VOC	38.67	.56	3.53	.01	1.00	.43	3.44	3.61
4 GRAY ORAL	24.41	1.16	1.74	1.72	1.00	.52	.04	.54

* p .01

TABLE IV

Contributions to the Variance in Reading Achievement Made by (1) MRT, (2) MRT with MEAN T-U plus RAT SUB/T-U, (3) MRT with TTR plus F L 3-5, and (4) MRT with Combination of All Language Variables

	1	2	3	4
ACHIEVEMENT MEASURES	Per Cent of Variance Accounted for by MRT	Additional Per Cent of Variance Accounted for by Adding MEAN T-U plus RAT SUB/T-U to the Equation with MRT	Additional Per Cent of Variance Accounted for by Adding TTR plus F L 3-5 to the Equation with MRT	Additional Per Cent of Variance Accounted for by Adding All Seven Language Variables to Equation with MRT
1 SAT WD	35.0% p < .0001	2.5% p < .3276	9.7% p < .0111	17.3% p < .0212
2 SAT PARA	20.4% p < .0003	8.5% p < .0427	3.3% p < .3069	15.2% p < .1254
3 SAT VOC	38.7% p < .0001	3.6% p < .1876	3.6% p < .1804	10.0% p < .2207
4 GRAY ORAL	24.4% p < .0001	1.7% p < .5211	2.6% p < .3755	7.3% p < .6074

3. A measure of syntactic complexity (mean length of T-unit) added significantly to the value of the Metropolitan Readiness Test in predicting comprehension achievement.

4. A combination of all seven experimental linguistic predictors added substantially to the value of the readiness test in predicting comprehension achievement.

In contrast, the results of the step-wise regression analyses showed that the linguistic predictors failed to add significantly to the value of the Metropolitan Readiness Test in predicting achievement on tests of listening vocabulary or oral reading. Therefore, Hypotheses 5 and 6 must be rejected for these two achievement measures.

Interpretations of the portions of the foregoing hypotheses that were rejected for the criterion vocabulary test must take into account the fact that the language items in the Metropolitan Readiness Test measure listening comprehension abilities which are also measured by the items on the criterion test. This fact helps to explain why the readiness test accounted for a higher per cent of the variance in vocabulary than in any other criterion test, and also why the vocabulary component in the linguistic predictors had little to add to the variance accounted for by the readiness measure.

In interpreting the findings for the criterion test of oral reading, it should be noted that the criterion test items on which most of the subjects were scored were relatively simple syntactically. Therefore, it appears that ability to deal with complex syntactic structures was not an important determinant of oral reading scores in first grade. Perhaps visual-perceptual and other factors were of over-riding importance at this instructional level. In any event, further research is needed to clear up the uncertainty on this issue.

Ancillary Findings.--Additional findings which may help provide clues to better understanding of both language development and of reading prediction emerged in the process of testing the hypotheses. These ancillary findings are presented below.

Intercorrelations among measures

A noteworthy ancillary finding was derived fro... examination of the intercorrelations among the linguistic measures used in this study. It was found that mean length of T-unit was substantially and significantly related to two measures of syntactic complexity: ratio of subordinate clause length of T-unit length, and ratio of sentence-combining transformations to T-units.

This finding serves to support indirectly the conclusion of earlier investigators, notably Templin and McCarthy, that average length of communication unit is a useful index of "maturity" in language development. It serves more directly to support the conclusion of O'Donnell, Griffin, and Norris that mean T-unit length is a valid indicator of children's development in syntactic control.

The relationship between intelligence and language measures

Coefficients of correlation between scores on a standardized measure of intelligence and scores on the experimental linguistic measures were low and non-significant.

This finding, based on performance of a sample of subjects within the normal range of intelligence, could be interpreted as tending to support Chomsky's theory that the acquisition of language is approximately independent of intelligence.

The relationship between sex and measures of language and reading achievement

Results of a one-way multivariate analysis of variance (in which language and reading scores were dependent variables and sex of subjects was the factor in the analysis) showed only one statistically significant difference in language performance of boys and girls. The boys were found to use a greater number of uncommon words from the Thorndike-Lorge list than did the girls. No significant differences were found between boys and girls in reading achievement, though a difference in favor of the girls in oral reading tended toward statistical significance.

The relationship between socio-economic status and measures of language and reading achievement

A one-way multivariate analysis of variance (using the present study's index of socio-economic status as the factor

in the analysis) revealed that for this sample of suburban school pupils there were only two statistically significant differences in linguistic measures among the three designated socio-economic strata. In comparison with the middle socio-economic group, the high-status subjects used a significantly greater per cent of the commonest Thorndike-Lorge words. The middle group scored significantly higher on ratio of subordinate clause length to T-unit length than the low-status subjects. There were no significant differences among the socio-economic groups in reading achievement.

Comparative complexity of the language of criterion tests and of oral language protocols

Examination of the criterion test of oral reading showed that the early paragraphs of the test (those on which the majority of the subjects were scored) were written in language relatively simpler in vocabulary and syntax than the oral language produced by the average subject in this investigation. On the test of paragraph comprehension, items which were extremely simple syntactically were found to be mixed with more complex items, without any apparent attempt at gradation of linguistic complexity throughout the thirty-three items on the test. Therefore, it was not possible to determine what proportion of subjects responded correctly to syntactically simple versus syntactically complex items on the comprehension test. However, it appeared likely that ability to respond correctly to complex syntactic structures was not a predominant factor in the achievement scores earned by a number of the subjects.

VII. LIMITATIONS OF THE STUDY:

The following are seen as limitations of the present investigation.

1. The measures of oral language competency used in this study, although carefully selected on the basis of previous research evidence which indicated that they were positively related to increasing chronological age of preschool and school-age children, were nevertheless experimental measures insofar as their relationship to reading is concerned. These measures may not have ade-

quately assessed the linguistic competencies which are most closely related to beginning reading achievement.

2. The investigation of the reliability of the linguistic measures revealed only moderate to low coefficients of reliability. Even when it is taken into account that (1) an increase in error variance may have occurred when two measures were used jointly in deriving a ratio measure, and (2) the chosen method of establishing reliability set the lower limits of reliability for the items, the fact remains that the reliability coefficients were generally low.

3. The selection of subjects from a suburban school district probably did not provide for as wide a spread in socio-economic status, intelligence and linguistic and achievement scores as might have been obtained from an area of greater geographic and demographic diversity.

VIII. CONCLUSIONS:

Based on the foregoing findings, and taking into account the limitations of this investigation, the following conclusions are drawn.

1. The value of the Metropolitan Readiness Test as a predictor of first-grade word-recognition achievement can be significantly increased by the addition of a measure of oral vocabulary range plus a measure of oral vocabulary diversity. An even greater increase in the value of the readiness test in predicting word-recognition achievement can be produced by the addition of all the experimental linguistic predictors used in this study.

2. The value of the Metropolitan Readiness Test as a predictor of first-grade comprehension achievement can be significantly increased by the addition of a measure of average length of T-unit. A substantial increase in the value of the readiness test as a predictor of comprehension can be produced by the addition of all the experimental linguistic predictors used in this study.

3. The value of the selected readiness test as a predictor of first-grade achievement in vocabulary or in oral reading cannot be significantly increased by the addi-

tion of any one or any of several combinations of the linguistic predictors used in this study.

4. The standardized test of reading readiness, when used alone as a predictor, can account for a greater per cent of the variance in each of four measures of first grade reading achievement than can any one or any of several combinations of the experimental linguistic predictors used in this study.

5. In the light of reliability findings for language measures in the present investigation, it cannot safely be assumed that a sample of oral language produced in a single interview provides a reliable or "representative" sample of what the subject might produce in response to differing stimuli or at different points in time.

IX. IMPLICATIONS OF THE STUDY:

The conclusions suggest two types of implications. The first type relates to possible contributions of the investigation to school situations. The second concerns further research efforts needed before substantial practical results can accrue from the present investigation.

Implications for Teachers.--This study did not yield dependable measures which could be easily used by teachers in the schools. Consequently, the practical implications are indirectly related to the conclusions of this study, and must still be based on teacher observations of children's language. Nevertheless, there are some implications of a general nature which may prove to have value to first-grade teachers who wish to enhance their ability to assess the linguistic competency of their pupils. These general guidelines for teachers are the following:

1. The pupil's volubility in the classroom (i.e., his willingness to "speak up" often and at length) is a very doubtful indication of his linguistic competency as it is related to potential reading achievement.

2. For practical purposes of linguistic assessment, the teacher should be keenly aware of the fact that the first-grader's ability to produce what is non-technically known as "a well-formed sentence" may be a useful guide to

his linguistic competency in relation to his potential reading achievement.

The teacher should also be watchful for indications that the pupil's oral vocabulary is wide and varied.

3. In order to secure optimally representative samples of some children's language, teachers need to observe children's language behavior in many types of situations. The teacher who desires a dependable assessment of the pupil's linguistic competency must extend his observations beyond the confines of the formal classroom situation, and beyond the scores on paper-and-pencil tests. He should listen to pupils during their free play, in the lunch room, during child-child conversations, and the like. In such varied situations, the alert teacher may secure valuable clues concerning the pupil's ability to speak in well-formed sentences and to use a wide and diverse vocabulary.

Implications for Research.--When the conclusions in this investigation are examined carefully, it becomes apparent that they provide only a starting-point for the additional research efforts needed in order to produce optimally useful implications. General suggestions for these investigative efforts are the following:

1. Continued, persistent and accelerated research is needed to determine the minimum level of oral language competency requisite for successful achievement in beginning reading. A variety of methods, procedures, and types of linguistic measures should be used and compared in these investigations.

2. Research effort should be directed toward the development of diagnostic procedures which will be useful in assessing and remedying linguistic deficiencies which may inhibit successful reading achievement.

Aspects of the two major research problems will be detailed in the next section.

X. RECOMMENDATIONS FOR FURTHER RESEARCH:

This investigation has provided some answers to the questions related to the hypotheses. However, specific suggestions for further research have emerged from both the findings in the present investigation and from the

questions not yet answered in the area of oral language-reading relationships. Specific recommendations for future investigations include the following:

1. Prior to or concomitant with further investigations related to children's oral language development, steps should be taken to resolve the methodological issue of reliability of oral language samples. It is impossible to make valid generalizations from data which are not known to be dependable, or to optimally reflect the typical language produced by children of a given age. Some of the questions that require answers in the search for dependable language measures are: (1) How much language should be recorded? (2) Do differing types of experimental situations (e.g., adult-child interviews; child-child conversations; "free-play" in the school setting; "free-play" in out-of-school settings) produce language which shows marked differences on measures of such factors as length of communication units, indices of syntactic complexity, or type-token ratio? (3) If such differing situations do in fact elicit measurably differing linguistic behaviors, what combinations of experimental situations are needed to produce optimally dependable language samples?

2. A continuing effort should be devoted to discovering ways of measuring oral language competency which will yield maximum results for the prediction of reading achievement. Specific suggestions to guide this continuing effort are the following: (1) The predictive value of mean length of T-unit should be compared with that yielded by Yngve's "mean word depth" measure, which Bormuth has found extremely useful in predicting comprehension difficulty. (2) The predictive values of all promising indices of syntactic complexity in oral language produced in "naturalistic settings" should be compared with that yielded by paper-and-pencil type tests of syntactic control, such as Ruddell's "Test of Syntax." These and similar comparative procedures may lead to a better understanding of which aspects of oral language are most closely related to early reading achievement. Furthermore, such comparative investigations could serve as steps toward achieving the long-range aim of developing improved methods of assessing oral language competencies--methods which will yield reliable, easily administered linguistic measures, feasible for incorporation into standardized readiness tests for both predictive and diagnostic purposes.

3. It would be desirable to conduct a follow-up study to determine the relationship between second-and-third-grade reading achievement scores of the subjects in the present investigation, and their first-grade readiness and language scores. The hypotheses in the present study could be retested, using the criterion measures obtained in the later grades.

Such a longitudinal investigation would add depth to findings in the present study. It would throw additional light on a basic question posed in this investigation: "Is the relationship between measures of oral language competency and early reading achievement strong enough to be useful for predictive purposes?"

Reed's study showed that the magnitude of relationship between scores on standardized tests of verbal ability and reading achievement scores increased as pupils progressed through the elementary grades. It would be of interest to determine whether a similar increase was apparent for language measures used in the present study, and for other such measures which appear to be promising.

4. Future investigation of oral language-reading relationships (regardless of what methods of language sampling and analysis are used) should provide stratification procedures which will insure the inclusion of subjects from environments judged conducive to extreme "linguistic deprivation."

5. It would be desirable to conduct a longitudinal study of linguistic development, starting at the age of beginning language acquisition, and carrying the investigation of the subjects' language development through the elementary grades. The measures of linguistic competency, obtained over time, should be related to subjects' reading achievement at each grade level. Such a longitudinal investigation holds promise of determining minimum levels of linguistic competency at differing ages which may be predictive of later reading achievement. It could also provide information concerning possible changes in oral language-reading relationships over time.

6. The final recommendation for further investigation into oral language-reading relationships transcends the quantitative approach to linguistic competency used in the present study. Some of the foregoing recommendations for research suggested means of improving and refining the "count and measure" techniques that have been used in this and previous investigations aimed at identifying oral language factors which are significant to beginning reading achievement. But there is a need for exploration of qualitative as well as quantitative aspects of oral language behavior. No guidelines for such explorations are offered--only a suggestion that new ways of assessing the quality and the content of children's oral language should be developed, first perhaps through case studies. The problem of oral language-reading relationships is extensive, vital, and not yet understood. There is hope that sophisticated explorations of the quality and the content of children's language will open new avenues to the solution of this problem.

XI. CONCLUDING STATEMENT:

This has been one of a small but much-needed group of investigations to determine factors in oral language which are related to beginning reading achievement. It represents a step toward the important goals of improving the prediction of early reading achievement, and of developing methods of diagnosing and remedying those linguistic behaviors which may inhibit successful reading.

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TITLE

Selected Factors in Spoken Language Related to First-Grade Reading Achievement

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SOURCE CODE

REPORT/SERIES NO.

OTHER SOURCE

SOURCE CODE

OTHER REPORT NO.

OTHER SOURCE

SOURCE CODE

OTHER REPORT NO.

PUB'L. DATE 24 -Jul-68 | CONTRACT/GRANT NUMBER OEC-0-8-080125-0109

PAGINATION, ETC.

26 p. (Also available as Unpublished Dissertation by Marguerite B. Bougere, Univ. of Chicago.)

RETRIEVAL TERMS

Language, Language Development, Language Research, Spoken Language-Reading Relationships, First-Grade Reading Achievement, Children's Spoken Vocabulary, Lorge-Thorndike List, Children's Syntax, Transformational Analysis, T-unit, Metropolitan Readiness Test, Type-Token Ratio.

IDENTIFIERS

ABSTRACT

In a search for means of specifying factors in spoken language which have been assumed related to beginning reading achievement, a linguistic analysis was made of the verbal output of a stratified random sample of first-grade beginners who responded to two silent films and a series of reader illustrations. Predictive data for the study consisted of (1) scores on selected linguistic measures and (2) scores on the Metropolitan Readiness Test, administered near the beginning of grade one. Criterion data were scores on the Gray Oral Reading Test and on three sub-tests of the Stanford Primary I Battery, administered near the end of grade one. A coefficient of reliability for each experimental language measure was obtained by a two-way analysis of variance technique. Correlational and regression techniques were used to determine magnitude of relationships among variables, to compare the predictive values of the readiness test and the experimental language measures, and to determine whether the language measures significantly increased the predictive value of the readiness test.